



**Real Application of  
Transformative Approaches for**

# **Teaching and Learning in the 21<sup>st</sup> Century**



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## Special Dedication

This book is dedicated to UNIMAS academicians who work hard in conducting the best teaching and learning experience. This book is hoped to be an inspiration to educators on how to implement the teaching and learning process more effectively.

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# Table of Contents

Special Dedication	vii
Preface	xi
Acknowledgement	xv

## **Theme 1: 21st Century Transformative Teaching and Learning Approaches**

Enriching Immersive Learning Experience During Movement Control Order (MCO) Through Blended Learning Substitution Method	1
E-SULAM Preservation of Bidayuh Language and Culture	13
Construction of Water Harvesting and Filtration System	21
Experiential Learning in Introducing Information Systems	29
Research based Learning through Immersive Face to Face Interaction	37

Transforming Physical Hands-on Laboratory Practice to Remote Laboratory Experimentation: A COVID-19 experience	47
Critical Thinking Session (CTS)	59
Immersive Learning on Environmental Chemistry Concepts through e-SULAM	65
Transformative Teaching via Workshop Based Approach in Scientific Communication	75
Teaching and Learning activities for Environmental Biotechnology	87
<b>Theme 2: Alternative Assessment Practices</b>	
Gamified Authentic Assessment and Its Role in Increasing Student Engagement with the Assessment Material	97
Effectiveness of Objective Structured Practical Examination (OSPE) as a Tool for Formative Assessment of Practical and Experimental Skill for Pre-University Students in Biology Course	107
An Alternative Assessment Approach Towards Learning Natural Sciences Communication	117
Inquiry-based Assessment – Transforming Wonder into Knowledge	127
Visual Representation of Students’ Experience: Alternative Assessment during COVID-19 Movement Control Order	137
List of Contributors	149

# Preface

*“It’s not just learning that’s important. It’s learning what to do with what you learn and learning why you learn things that matter.” -Norton Juster*

The Real Application of Transformative Approaches for Teaching and Learning in the 21st Century book was produced to appreciate the transformative work of lecturers in teaching and learning. This book is expected to serve as a guide to other lecturers in helping them to improve their teaching approach, delivery, and assessment of their courses. Lecturers can also use this book to develop their ideas and creativity in designing teaching and learning according to current needs and align with the learning outcomes of the course.

Global changes in the twenty-first century have altered the landscape of teaching and learning, particularly in delivery methods, approaches, and assessments. This is due to the fact that the student body is made up of generation Z, who have different styles of learning than that of the lecturers. Conventional methods used by lecturers are no longer an option for today’s students. Therefore, lecturers must transform their teaching and learning in order to be relevant to today’s students.

The combination of transformative approaches introduced becomes the strength of this book's content. Authors combine diverse approaches, delivery, and assessment in teaching to ensure the effectiveness of teaching to students. Moreover, the collaborative approach used provides an alternative for lecturers to minimize the burden on students for courses taken. This approach has the potential to have a greater impact, particularly in terms of student understanding of learning.

The element of creativity incorporated is also a strength of this book. Authors explain some terms and concepts using diagrams and figures to help the reader understand. The steps and procedures for carrying out teaching and transformative approaches are stated in a systematic manner to help the reader understand what is being conveyed.

The book also includes writers from various backgrounds. This distinguishes it as a unique and comprehensive manuscript. Readers are guided through conceptual and practical understanding of teaching and learning methods. The author's presentation of basic concepts and applications can help the reader understand knowledge more deeply and broadly.

Crafting a learning environment where students are able to explore and understand how the physical world works, and to connect complex scientific concepts to their daily lives is vital. It also includes building students' confidence in their ability to solve challenging problems and empowering them to build a better future for themselves and others. CTS is one of a better way of learning that will prepare students towards focusing on being very collaborative, self-motivated and self-directed all the time staying true to the lifelong learning values, which are imperative to carve a better future for the students in their field of choice.

The next project is related to the environmental issues relating to solid waste, wastewater, and hazardous waste viewed in the context of their treatments. This course has been implementing service learning (SULAM) as a part of an immersive learning approach since Semester 2, 2017/2018. In the previous years, i.e. 2017/2018, and 2018/2019, the

course assessment included either a final examination (40%, session 2017/2018), or a mid-term examination (30%, session 2018/2019). Although SULAM implementation in this course has generally improved the CLO achievement since 2017/2018, the pen and paper examination has resulted in some students not achieving the intended CLOs. Instructors were not sure on the effectiveness of examination in creating a deep learning experience for students.

Therefore, in semester 2, 2019/2020, mid-term examination was replaced with case-study analysis to (1) encourage higher order thinking skills among students and (2) cultivate the sense of commitment and responsibility among students to find innovative solutions towards waste management issues. In addition, students' e- SULAM projects as well as group discussion and engagement with target community were implemented on online platforms. Students' reflection on their e-SULAM projects was recorded on their e-portfolio. Implementation of immersive learning through blended learning in this course has resulted in improved CLO achievement as compared to the past two years. Students' reflection on their learning experience in this course implied the effectiveness of immersive learning (blended learning) approach in this course.

Besides that, the project involved transforming the typical class lecture into an interactive scientific communication environment. Students were exposed to the real scientific communication via workshop-style delivery, project-oriented problem-based learning (PoPBL) on proposal writing projects, and brainstorming/discussion activities during weekly meetings. The initiative eliminated the traditional lecture and end-of-semester assignment practices.

Another project is MATHX Project, a new project-based learning instrument that allows digital students to work collaboratively, purposely implemented to develop teamwork and student's management skills. Students translated acquired knowledge to applications and STEM projects. The integration of digital technology used in this project helps students create meaningful and enjoyable learning experiences in Mathematics.

The following project is related to the assessment in learning. In order to improve learning via assessment conduct, assessment must be objective, significant, and magnitude. OSPE has/have been adapted and implemented for Biology students in Centre for Pre-University Studies to assess know-what and know-how practical competencies following the objective and structured manner with direct observation of the students' performance. The assessment provides meaningful learning experience to the students as it can assess all three domains (cognitive, affective, and psychomotor).

Furthermore, the enriching immersive learning experience during movement control order (MCO) was possible through blended learning substitution method. Finally, one project is related to social media and animation software offering several attractive features that may overcome the limitations of the existing educational portals. The team introduced the use of YouTube, Instagram, and Doodly as supplementary platforms for teaching Environmental Biotechnology in Semester 2 2019/2020 which resulted in excellent academic performance and positive feedbacks from the students.

Finally, this book discussed also describe the course MDP30609 Community Medicine and Public Health posting, the assessment has been modified by adopting the Alternative Assessment method. The Alternative Assessment is regarded as comprehensive, where it assesses the candidates' ability to integrate writing task and performance, divergent thinking in solving problems and enhancement of meaning skills.


# Acknowledgement

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Thanks to all award recipients who have contributed to the chapters of the book. They are Associate Professor Dr Cheah Whye Lian, Dr Kuryati binti Kipli, Dr Melody Kimi, Mohamad Faizuan bin Mat, Abdul Halim bin Hashim, Dr Chung Hung Hui, Dr Norazlina binti Bateni, Ahmad Alif bin Kamal, Dr Yvonne Michelle Campbell, Nor Hayati binti Jaya, Dr Rafeah Wahi, Professor Dr Zainab binti Ngaini, Norhunaini binti Mohd Shaifullah, Rohaiza binti Daud, Associate Professor Dr Afzan binti Ahmad Zaini, and Dr Nurashikin binti Suhaili. Not to forget to everyone who have been involved directly or indirectly in producing this book, our deepest appreciation goes to all of you.







# Construction of Water Harvesting and Filtration System

Abdul Wafi Razali, Shazwan Mohamed Shaari

## **Summary/Synopsis of Project/Initiative**

The construction of rainwater harvesting and filtering system was conducted by the Faculty of Built Environment on 7-8 March 2020 at Kampung Sungai Putin, located at Asajaya approximately 63 KM from Kuching city. The village suffers from water supply shortages especially during dry season. The water supply pressure from the nearest water treatment has failed to distribute the water supply to the village. Jabatan Bekalan Air Luar Bandar (JBALB) who supplies clean water to the villagers are constrained by the limited number of water tankers to make sufficient trips. Most of the houses were supplied with sufficient water tank from the state government for rainwater harvesting.

Dobrowsky et al. (2014) studied on rainwater quality. The nature of rainwater is considered clean if they are collected in a proper way. Poor quality of harvested rainwater is merely caused by the improper design system and lack of maintenance as being reported in various articles. In similar vein, Lee et al. (2012) acknowledged that rainwater is a good water source – if the catchment and rainwater tank are managed well, it can be used as drinking water without any other treatment.

However, in Kampung Sungai Putin, poor installation and filtering system have been identified during the site visit where the rainwater harvested is contaminated and therefore, dangerous to consume. Hence, this project aims to construct/install a proper rainwater harvesting and a filtering system at two designated areas for the benefit of the community. A sharing knowledge session was conducted with the community at Kampung Sungai Putin at the end of project completion via online video conference.

### **Project Rationale**

Teaching and learning methods play an important role towards students' academic achievement. Some courses require learning experience through the integration of theoretical and practical knowledge especially for professional programmes. The integration of theory and practical help students to enhance their ability to see things differently, improve problem solving, leadership and communication skills.

We believe that service learning integrates both the cognitive and affective domains by bridging a gap between theory and practice in a real-case situation. Focusing too much on cognitive while undervaluing affective learning hinders high-quality learning experience. Therefore, cognitive and affective attributes should not be separated in higher education to ensure a holistic learning process.

### **Approach**

This project is issue-based. It requires students to apply the theoretical knowledge to solve a real-case scenario through community engagement. The issue encountered by the community was first identified by the faculty lecturers. A preliminary site visit with the community was conducted to have a clear view of the unsolved problems before starting off the project. Students were required to engage with the community to determine and propose some potential solutions to the problems. The design of water harvesting infiltration system follows the fitting principles.

## **Students' Engagement/Involvement**

The project has engaged in meaningful learning in terms of learning, psychomotor and affective abilities. Students' learning skills were obtained through problem solving and critical analysis of community problems. It is enhanced by their ability to identify and use appropriate tools and methods to solve the problems. Therefore, their psychomotor skills were developed, in which their skills are performed competently during the construction stage. Student's affective abilities were also observed through proactive leadership and communication among the students and community at large.

Service-based learning is a great experiential learning opportunity for the students to explore and provide service to facilitate community issues. Students were immersed in the service-based activity and it can be observed through their behaviour/reaction throughout the project and individual reflections presented in their e-Portfolio. Students are highly engaged in active learning. Each student was given tasks in several stages during the project and participated actively throughout the semester. They managed to demonstrate satisfactory effort in communicating and coordinating among themselves to completely achieve the objectives of the project.

## **Impact on Students' Learning**

Students were able to answer questions pertaining to the output of the project (i.e., tools, methods, theories, village issues and proposed solution) very fluidly when asked formally (to report) and informally (through conversation). Examples of proposed design presentation can be referred as follows.

i. Bilik Gerakan Kampung Sungai Putin;

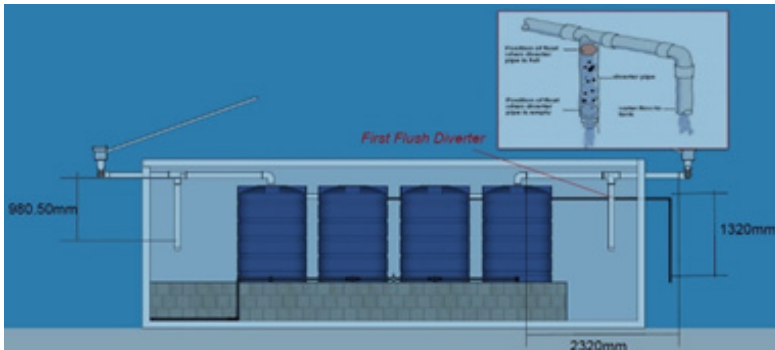


Figure 1 - Bilik Gerakan Kampung Sungai Putin Front Elevation View

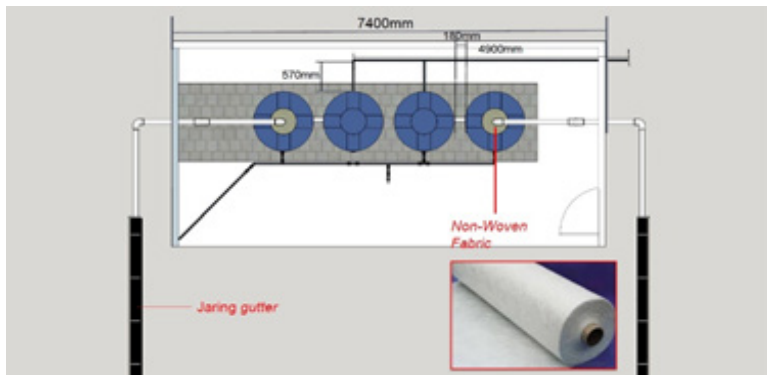


Figure 2 - Bilik Gerakan Kampung Sungai Putin Plan View

ii. Masjid Kampung Sungai Putin



Figure 3 - Masjid Kampung Sungai Putin Front Elevation View

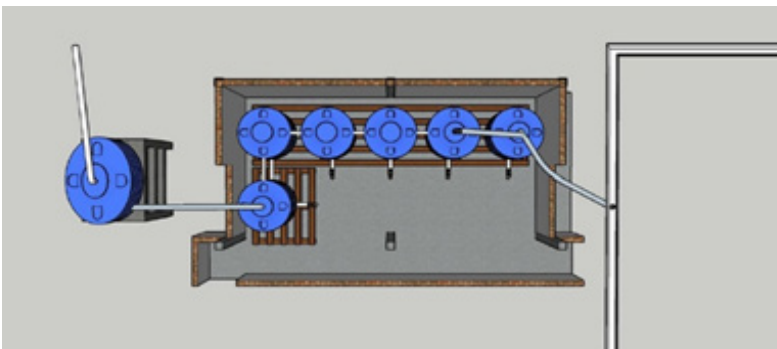


Figure 4 - Masjid Kampung Sungai Putin Plan View

They demonstrated competency in handling tools during the construction stage (i.e., paint work, pipe, gutter and filter installation), showed compliance and were mindful of the safety measures that were involved with the tasks.

Students bonded with each other through this project. They also demonstrated more interest to the cause after meeting with the villagers and expressed empathy to the issue faced by the villagers. Despite different backgrounds, the students managed to effectively communicate with the villagers harmoniously. The project was done in a pleasant environment that the villagers were excited for these students to return – not just for the tangible output of the project, but for their spirited and kind presence.

### **Improvement Project/Initiative in Future**

The project focus is mainly to help the community that require clean and reliable water supply by developing an impactful rainwater harvesting and filtration system. The proposed rainwater harvesting and filtration system was designed according to two (2) designated locations. Further engagement with the same community is essential to gather all the feedbacks in regard to the rainwater system operation and maintenance to allow necessary improvement. It is imperative to ensure the system design can be applied by the community to tailor their basic needs.

### **Related Learning Outcome Clusters MQF 2.0**

The project revealed four related learning outcome clusters (MQF 2.0), which are:

- **Cognitive skills:** Theories of Building Services were discussed and designed upon problem-based scenario.
- **Practical skills:** The theories were applied to solve the community's problems by constructing rainwater harvesting and filtration system that was designed.

- **Interpersonal skills:** Team building was apparent during the designing stage, improving communication skills among members. During the engagement stage, students' interpersonal skills with the community were developed.
- **Leadership autonomy and responsibilities:** The students were groomed to represent the faculty to deliver an engagement project. Their active roles in the project created a sense of responsibility, belonging and significance toward the community and the programme itself.

### **Acknowledgement**

I would like to thank UNIMAS Community Sustainability Centre for the funding of the project. I am grateful and proud of the students, as well as the lecturers who are involved throughout the project. Last but not least, my heartfelt gratitude towards the community in Kampung Sungai Putin, whose inclusiveness and hospitality are beyond par.

### **Keywords**

Rainwater harvesting, filtration system, community-based learning

### **References**

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